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Research Regarding the Interaction Genotype x Technological Factors in Morphological Features of Chilli Pepper Cultivated in Solaria at the Experimental Station of Timisoara, Romania

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Abstract

The history of bell pepper started 3,000-4,000 years ago, in Peru, in the old Inca Empire, whose civilisation used to practice a flowering agriculture. In a museum of Lima, Peru, they exhibited bell pepper fruits old a few thousand years and vases representing plants and bell peppers found during archaeological findings in Inca tombs. Experiments carried out during 2014-2015 had a polyfactorial character; variants were set after the randomised block method with three replicates specific to experiments in forced protected areas of vegetable culture. Factor A (cultivar) with 5 graduations: a_1 – Délibáb F_1; a_2 – Sláger F_1; a_3 – Bolero F_1; a_4 – SJD 5; a_5 – SJN 5. Factor B (planting scheme) with 4 graduations: b_1 – 40+80x20 cm → 8,3 plants/m^2; b_2 – 40+80x30 cm → 5,5 plants/m^2; b_3 – 40+80x40 cm → 4,2 plants/m^2; b_4 – 40+80x50 cm → 3,3 plants/m^2. Unilateral statistic evaluation of the influence of genotype and of plant density on fruit length is distinctly significant on the background of significant influence of environmental conditions during the experimental years. Changing the planting distance per row from 20 to 30 and to 50 cm resulted in significant increase of fruit length of 8-18%. The combined effect of genotype and plant density had considerable influences (18.81%) on fruit diameter, a value that is distinctly significant. The bell pepper hybrid Bolero and the bell pepper line SJD 5 cultivated at a plant density of 8.3 plants/m^2 (80/40x20 cm) produce pulp thickness superior to that of the experimental mean.

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Keywords: *Capsicum annuum* L., pepper, morphological characters, solarium type.

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1. Introduction

The area of distribution of bell pepper (*Capsicum annuum* L.) correlates with areas favourable to this thermophilous plant, i.e. 55° Southern latitude and 55° Northern latitude, mainly in southern areas. Most researchers consider the Central America is the native area of bell pepper (Rimóczi, 2003).

In Romania, it came from Bulgaria and has been cultivated since the 19th century. Bulgarian vegetable growers knew how to maintain the form and evenness of the fruit. The first paprika bell pepper cultures started around Timisoara (Cenadul Mare, Tomnatic, Lovrin), about 1923. The equipment for the drying and manufacturing of paprika were rudimentary: drying was done in wood heated areas and grinding was done with four couples of grinding stones. In 1949, they established the first equipment for the grinding of bell pepper and a combined machine where the manufacturing was mainly mechanised (Bereşiu, Voinea, 1977).

In 1921, it was exhibited at the exhibition of the "Swabian Agricultural Association of the ploughmen from Timiş – Torontal", organised in Lovrin, in the Liptay Park (Berar et al., 2011, Ursu et al., 2012, 2013).

The taxonomic definition below presents the issues that, though frequently faced and apparently solved, have never been totally dealt with. Together with the cultivated species, *Capsicum annuum*, there are other four species cultivated: *C. frutescens*, *C. pubescens*, *C. baccatum*, and *C. chinense*. They are also found in the wild (Balázs, 1993).

Due to the strong polymorphism of the plant and fruit, classifying the numerous varied cultivars of the species *Capsicum annuum* is extremely difficult. This explains the different classifications of the different authors mentioned in literature (Somogyi, Garcia, 1998, Somogyi, 2010).

Hristov, Popov and Dimov (1975) classify the cultivated bell pepper cultivars into three sub-species: *macrocarpum*, large bell pepper fruit; *microcarpum,* small bell pepper fruit; and *fasciculatum,* decorative bell pepper. In its turn, spp. *macrocarpum* contains the convar. *grossum* (bell pepper), convar. *tetragonum* and convar. *longum* (long pepper). The ssp. *microcarpum* contains the convar. *accuminatum* (pointed chilli pepper) and the convar. *cerasiforme* (cherry-shaped pepper) (Apahidean, 2000, Vlahova, Popov, 2014).

The large number of classifications and the existing taxonomic difficulties has caused the confusion between the different, more primitive cultivars of *C. annuum*, *C. frutescens* or *C. chinense.* To operate proper differentiation and classification, they adopted as a criterion the ability of combining and producing interspecific bell pepper hybrids. The results of adopting this criterion is that *C. annuum* can be sued as a mother genitor in the wild species *C. chacoense.* Crossing *C. chinense, C. frutescens* and *C. baccatum* is extremely difficult (Bosland, Votava, 1999, Cavero et al, 2001, Márkus, Kapitány, 2001).

2. Materials and Methods

Experiments were carried out at the Experimental Station of the Faculty of Horticulture and Forestry of Timisoara, in a 400 m^2 solarium, built and equipped with environmental automated control systems and equipments funded by the Transborder Cooperation Programme Hungary-Romania 2007-2013, i.e. the partnership contract HURO/0801/143.

Experiments carried out during 2014-2015 had a polyfactorial character; variants were set after the randomised block method with three replicates specific to experiments in forced protected areas of vegetable culture.

Factor A (cultivar) with 5 graduations: a_1 – Délibáb F_1; a_2 – Sláger F_1; a_3 – Bolero F_1; a_4 – SJD 5; a_5 – SJN 5.

Factor B (planting scheme) with 4 graduations: b_1 – 40+80x20 cm → 8,3 plants/m^2; b_2 – 40+80x30 cm → 5,5 plants/m^2; b_3 – 40+80x40 cm → 4,2 plants/m^2; b_4 – 40+80x50 cm → 3,3 plants/m^2.

Observations were made using the current technique of descriptors and evaluation grades specific to the species (Ciulca, 2002).

3. Results and Discussions

3.1. Fruit length

Experiments show that both genotype (bell pepper lines and hybrids) and plant density had a real, significant influence on fruit length on the background of evenness of environmental conditions of the experimental setting. Mean values of fruit length (Table 1) in the genotypes studied had a span of 2.81 with limits between 14.31 cm in

the bell pepper hybrid Bolero and 17.12 cm in the bell pepper line SJD 5 on the background of low interpopulation variability span (6.96%).

Table 1. Genotype effect on fruit length at paprika pepper (Didactic Base Timişoara – 2014-2015)

Genotype	Fruit length (cm)		Relative values (%)	Difference / Significance
Sláger - Délibáb	14,97	16,05	93,27	$-1,08^{00}$
Bolero - Délibáb	14,31	16,05	89,16	$-1,74^{000}$
SJD 5 - Délibáb	17,12	16,05	106,67	1,07**
SJN 5 - Délibáb	15,24	16,05	94,95	$-0,81^{0}$
Bolero - Sláger	14,31	14,97	95,59	-0,66
SJD 5 - Sláger	17,12	14,97	114,36	2,15***
SJN 5 - Sláger	15,24	14,97	101,80	0,27
SJD 5 - Bolero	17,12	14,31	119,64	2,81***
SJN 5 - Bolero	15,24	14,31	106,50	0,93*
SJN 5 - SJD 5	15,24	17,12	89,02	$-1,88^{000}$

$LSD_{5\%}$ = 0,71 cm; $LSD_{1\%}$ = 0,99 cm; $LSD_{0,1\%}$ = 1,40 cm.

The bell pepper hybrid Délibáb also had values superior to those of the bell pepper line SJN 5 and of the bell pepper hybrids Sláger and Bolero.

As for the unilateral effect of studied densities (Table 2), fruit length in different genotypes had a span of 0.57 cm with values between 15.22 cm in the planting scheme 80/40x30 cm and 15.79 cm in the planting scheme 80/40x20 cm, on the background of very low variability span (1.77%).

Table 2. Density effect on fruit length at paprika pepper (Didactic Base Timişoara – 2014-2015)

Density (cm)	Fruit length (cm)		Relative values (%)	Difference / Significance
80/40x30 – 80/40x20	15,22	15,79	96,39	$-0,57^{0}$
80/40x40 – 80/40x20	15,74	15,79	99,68	-0,05
80/40x50 – 80/40x20	15,39	15,79	97,47	-0,40
80/40x40 – 80/40x30	15,74	15,22	103,42	0,52*
80/40x50 – 80/40x30	15,39	15,22	101,12	0,17
80/40x50 – 80/40x40	15,39	15,22	101,12	0,17

$LSD_{5\%}$ = 0,47 cm; $LSD_{1\%}$ = 0,61 cm; $LSD_{0,1\%}$ = 0,81 cm.

In accordance with variance analysis, the differences between fruit length associated with the different planting schemes are lower than in genotypes, some of which reached the level of statistic ensurance.Thus, we see that increasing distance per row from 20 to 30 cm reduced significantly (3.6%) the values of this feature.

Changing the nutrition area from 80/40x30 cm to 80/40x40 cm caused a significant increase of about 3.4% fruit length (Table 3).

Table 3. The effect of genotype and density on fruit length at paprika pepper (Didactic Base Timişoara – 2014-2015)

Genotype	Density (cm)				$\bar{x} \pm s_{\bar{x}}$	$S_{\%}$
	80/40x20	80/40x30	80/40x40	80/40x50		
Délibáb	x17,09b	y15,51ab	y15,53b	y16,09ab	16,05±0,22	5,49
Sláger	y14,30c	y14,91bc	x16,19ab	y14,47c	14,97±0,23	6,07
Bolero	x14,43c	x14,08c	x14,74b	x13,98c	14,31±0,14	3,80
SJD 5	x18,34a	y16,30a	y16,93a	y16,90a	17,12±0,25	5,80
SJN 5	x14,80c	x15,31ab	x15,34b	x15,53b	15,24±0,15	3,86
$\bar{x} \pm s_{\bar{x}}$	15,79±0,39	15,22±0,20	15,74±0,21	15,39±0,27	15,54±0,14	
$S_{\%}$	11,20	5,82	6,04	7,79	8,04	

-Genotype $LSD_{5\%}$ = 1,10 cm; $LSD_{1\%}$ = 1,47 cm; $LSD_{0,1\%}$ = 1,92 cm (a,b,c).
-Density $LSD_{5\%}$ = 1,03 cm; $LSD_{1\%}$ = 1,39 cm; $LSD_{0,1\%}$ = 1,81 cm (x,y,z).

3.2. Fruit diameter

As for the effect of genotype on fruit diameter in Table 4, we see that the studied bell pepper hybrids and lines had mean values ranging between 18.86 mm in Délibáb F_1 and 24.80 mm in the bell pepper hybrid Bolero F_1, with a span of variation of 5.94 mm, on the background of medium variability span of 13.71%.

Thus, the bell pepper hybrid Bolero and the bell pepper line SJN 5 had the highest values of fruit diameter and very significant increases of 21-31% compared to the rest of genotypes. In general, there were no major differences in mean fruit diameter between the genotypes Délibáb F_1, Sláger F_1 and SJD 5.

Table 4. Genotype effect on fruit diameter at paprika pepper (Didactic Base Timişoara – 2014-2015)

Genotype	Fruit diameter (mm)		Relative values (%)	Difference / Significance
Sláger – Délibáb	19,11	18,86	101,33	0,25
Bolero – Délibáb	24,80	18,86	131,50	5,94***
SJD 5 – Délibáb	19,74	18,86	104,67	0,88*
SJN 5 – Délibáb	24,28	18,86	128,74	5,42***
Bolero – Sláger	24,80	19,11	129,77	5,69***
SJD 5 – Sláger	19,74	19,11	103,30	0,63
SJN 5 – Sláger	24,28	19,11	127,05	5,17***
SJD 5 – Bolero	19,74	24,80	79,60	-5,06^{000}
SJN 5 – Bolero	24,28	24,80	97,90	-0,52
SJN 5 – SJD 5	24,28	19,74	123,00	4,54***

$LSD_{5\%}$ = 0,86 mm; $LSD_{1\%}$ = 1,22 mm; $LSD_{0,1\%}$ = 1,73 mm.

As far as the unilateral effect of planting schemes is concerned (Table 5), fruit diameter had a variation span of 0.61 mm, with values between 21.12 mm in the planting scheme 80/40x30 cm and 21.73 mm in the planting scheme 80/40x40 cm, with extremely low variability span (1.24%). Taking into account the results in all genotypes, fruit diameter was not influenced considerably and significantly by the changing of plant density by using different planting schemes.

Table 5. Density effect on fruit diameter at paprika pepper (Didactic Base Timişoara – 2014-2015)

Density (cm)	Fruit diameter (mm)		Relative values (%)	Difference / Significance
80/40x30 – 80/40x20	21,12	21,24	99,44	-0,12
80/40x40 – 80/40x20	21,73	21,24	102,31	0,49
80/40x50 – 80/40x20	21,34	21,24	100,47	0,10
80/40x40 – 80/40x30	21,73	21,12	102,89	0,61
80/40x50 – 80/40x30	21,34	21,12	101,04	0,22
80/40x50 – 80/40x40	21,34	21,73	98,21	-0,39

$LSD_{5\%}$ = 0,62 mm; $LSD_{1\%}$ = 0,83 mm; $LSD_{0,1\%}$ = 1,09 mm.

From the point of view of the influence of different densities on fruit mean diameter in each genotype (Table 6) we see that the highest variation spans were in the bell pepper hybrids Bolero (1.86 mm) and Sláger (1.41 mm), while in the bell pepper line SJN 5, the span was lower (1.26 mm).

Table 6. The effect of genotype and density on fruit diameter at paprika pepper (Didactic Base Timişoara – 2014-2015)

Genotype	Density (cm)				$\bar{x} \pm s_{\bar{x}}$	$S_{\%}$
	80/40x20	80/40x30	80/40x40	80/40x50		
Délibáb	xy18,37b	xy19,32bc	y18,19c	x19,59b	18,86±0,22	4,.67
Sláger	xy19,36b	y18,19c	x19,60b	xy19,31b	19,11±0,23	4,83
Bolero	xy24,97a	xy24,60a	x25,75a	y23,89a	24,80±0,26	4,16
SJD 5	x18,85b	x19,72b	x20,17b	x20,23b	19,74±0,21	4,21
SJN 5	24,65a	23,80a	24,96a	23,70a	24,28±0,18	2,91
$\bar{x} \pm s_{\bar{x}}$	21,24±0,69	21,12±0,60	21,73±0,71	21,34±0,49	21,36±0,31	
$S_{\%}$	14,56	12,76	14,58	10,27	12,97	

-Genotype $LSD_{5\%}$ = 1,44 mm; $LSD_{1\%}$ = 1,92 mm; $LSD_{0,1\%}$ = 2,52 mm (a,b,c).
-Density $LSD_{5\%}$ = 1,40 mm; $LSD_{1\%}$ = 1,87 mm; $LSD_{0,1\%}$ = 2,45 mm (x,y,z).

3.3. Pulp thickness

As for the effect of the genotype on pulp thickness (Table 7), the studied bell pepper hybrids and lines had mean values ranging between 1.613 mm in the bell pepper line SJD 5 and 2.147 mm in the bell pepper hybrid Bolero F_1, with a variation span of 0.534 mm, on the background of medium interpopulation variability span (10.97%). Thus, the bell pepper hybrid Bolero and the bell pepper line SJN 5 produced the thickest pulp and very significant increases of 6-31% compared to the rest of genotypes. Pulp thickness in the bell pepper hybrid Sláger and the bell pepper line SJD 5 was significantly inferior to that of the bell pepper hybrid Délibáb.

Table 7. Genotype effect on pulp thickness at paprika pepper (Didactic Base Timişoara – 2014-2015)

Genotype	Pulp thickness (mm)		Relative values (%)	Difference / Significance
Sláger - Délibáb	1,897	1,988	95,42	-0,091^{0}
Bolero - Délibáb	2,147	1,988	108,00	0,159**
SJD 5 - Délibáb	1,613	1,988	81,14	-0,375^{000}
SJN 5 - Délibáb	2,114	1,988	106,34	0,126**
Bolero - Sláger	2,147	1,897	113,18	0,250***
SJD 5 - Sláger	1,613	1,897	85,03	-0,284^{000}
SJN 5 - Sláger	2,114	1,897	111,44	0,217***
SJD 5 – Bolero	1,613	2,147	75,13	-0,534^{000}
SJN 5 - Bolero	2,114	2,147	98,46	-0,033
SJN 5 – SJD 5	2,114	1,613	131,06	0,501***

$LSD_{5\%}$ = 0,086 mm; $LSD_{1\%}$ = 0,120 mm; $LSD_{0,1\%}$ = 0,172 mm.

As for the unilateral effect of the planting schemes, pulp thickness had a variation span of 0.134 mm, with values between 1.877 mm in the planting scheme 80/40x50 cm and 2.011 mm in the planting scheme 80/40x20 cm, with low variability span (3.36%) (Table 8).

Changing plant density did not cause predictable variation of pulp thickness. The lowest mean values of this feature were in the planting scheme 80/40x30 cm and 80/40x50 cm, while in the other two planting schemes pulp thickness was significantly higher.

Table 8. Density effect on pulp thickness at paprika pepper (Didactic Base Timişoara – 2014-2015)

Density (cm)	Pulp thickness (mm)		Relative values (%)	Difference / Significance
80/40x30 – 80/40x20	1,917	2,011	95,33	-0,094^{00}
80/40x40 – 80/40x20	2,003	2,011	99,60	-0,008
80/40x50 – 80/40x20	1,877	2,011	93,34	-0,134^{000}
80/40x40 – 80/40x30	2,003	1,917	104,49	0,086**
80/40x50 – 80/40x30	1,877	1,917	97,91	-0,040
80/40x50 – 80/40x40	1,877	2,003	93,71	-0,126^{000}

$LSD_{5\%}$ = 0,064 mm; $LSD_{1\%}$ = 0,086 mm; $LSD_{0,1\%}$ = 0,114 mm.

From the perspective of the influence of different densities on pulp thickness in each genotype (Table 9), the highest variation spans were in the bell pepper hybrids Sláger (0.303 mm) and Bolero (0.304 mm), while in the bell pepper line SJD 5 span was considerably lower (0.124 mm).

Table 9. The effect of genotype and density on pulp thickness at paprika pepper (Didactic Base Timişoara – 2014-2015)

Genotype	Density (cm)				$\bar{x} \pm s_{\bar{x}}$	$S_{\%}$
	80/40x20	80/40x30	80/40x40	80/40x50		
Delibab	xy1,942b	xy2,026a	x2,080ab	y1,906ab	1,988±0,021	4,31
Slager	x2,015b	y1,740b	x2,043b	y1,792bc	1,897±0,037	7,75
Bolero	x2,313a	xy2,060a	x2,205a	y2,009a	2,147±0,033	6,23
SJD 5	x1,536c	x1,609b	x1,648c	x1,660c	1,613±0,016	4,03
SJN 5	x2,249a	xy2,152a	xy2,038b	y2,018a	2,114±0,029	5,41
$\bar{x} \pm s_{\bar{x}}$	2,011±0,064	1,917±0,049	2,003±0,044	1,877±0,033	1,952±0,025	
$S_{\%}$	14,27	11,33	9,94	7,95	11,38	

-Genotype $LSD_{5\%}$ = 0,148 mm; $LSD_{1\%}$ = 0,198 mm; $LSD_{0,1\%}$ = 0,258 mm (a,b,c).

-Density $LSD_{5\%}$ = 0,146 mm; $LSD_{1\%}$ = 0,194 mm; $LSD_{0,1\%}$ = 0,254 mm (x,y,z).

3.4. Fruit number per plant

Mean values of the number of fruit (Table 10) in the studied genotypes had a span of 42.72, with limits from 51.71 in the bell pepper line SJN 5 to 94.43 in the bell pepper hybrid Sláger, on the background of high interpopulation variability span (25.57%). The bell pepper hybrid Sláger and the bell pepper line SJD 5 produced a number of fruit superior to those of the other genotypes, with statistically ensured increases of 24-45%. The bell pepper hybrid Délibáb had values of this feature significantly superior to those of the bell pepper hybrid Bolero F_1 and of the bell pepper line SJN 5.

Table 10. Genotype effect on fruit number/plant at paprika pepper (Didactic Base Timişoara – 2014-2015)

Genotype	Fruit number/plant		Relative values (%)	Difference / Significance
Sláger - Délibáb	94,43	74,51	126,73	19,92***
Bolero - Délibáb	60,06	74,51	80,61	-14,45^{000}
SJD 5 - Délibáb	92,79	74,51	124,53	18,28***
SJN 5 - Délibáb	51,71	74,51	69,40	-22,80^{000}
Bolero - Sláger	60,06	94,43	63,60	-34,37^{000}
SJD 5 - Sláger	92,79	94,43	98,26	-1,64
SJN 5 - Sláger	51,71	94,43	54,76	-42,72^{000}
SJD 5 – Bolero	92,79	60,06	154,50	32,73***
SJN 5 - Bolero	51,71	60,06	86,10	-8,35^{00}
SJN 5 – SJD 5	51,71	92,79	55,73	-41,08^{000}

$LSD_{5\%}$ = 5,85; $LSD_{1\%}$ = 8,20; $LSD_{0,1\%}$ = 11,59.

As far as the unilateral effect of the studied densities is concerned (Table 11), the number of fruit in the different genotypes had a span of 14.93 with values between 65.39 in the planting scheme 80/40x20 cm and 80.32 in the planting scheme 80/40x50 cm, on the background of low variability span (9.37%).

In accordance with variance analysis, we see that the differences between the numbers of fruit associated to the different planting schemes are lower than in the case of bell pepper cultivars, but most of them are significant.

Thus, increasing row distance increased progressively and significantly the number of fruit with about 9-12% per 10 cm. Only when changing row distance from 40 to 50 cm the change of this features was insignificant.

Table 11. Density effect on fruit number/plant at paprika pepper (Didactic Base Timişoara – 2014-2015)

Density (cm)	Fruit number/plant		Relative values (%)	Difference / Significance
80/40x30 – 80/40x20	73,25	65,39	112,02	7,86***
80/40x40 – 80/40x20	79,85	65,39	122,11	14,46***
80/40x50 – 80/40x20	80,32	65,39	122,83	14,93***
80/40x40 – 80/40x30	79,85	73,25	109,01	6,60***
80/40x50 – 80/40x30	80,32	73,25	109,65	7,07***
80/40x50 – 80/40x40	80,32	79,85	100,59	0,47

$LSD_{5\%}$ = 2,92; $LSD_{1\%}$ = 3,91; $LSD_{0,1\%}$ = 5,12.

On the background of the influence of different planting schemes on the number of fruit/plant in each genotype (Table 12), the highest variation span (33.60) was in the bell pepper hybrid Sláger, while in the bell pepper hybrid Bolero variation span was considerably lower (4.71).

Table 12. The effect of genotype and density on fruit number/plant at paprika pepper (Didactic Base Timişoara – 2014-2015)

Genotype	Density (cm)				$\bar{x} \pm s_{\bar{x}}$	$S_{\%}$
	80/40x20	80/40x30	80/40x40	80/40x50		
Délibáb	z57,64c	y71,13c	x86,90b	x82,38c	74,51±3,17	17,02
Sláger	z72,12b	xy102,05a	y97,83a	x105,72a	94,43±3,57	15,13
Bolero	x58,22c	x57,64d	x62,93c	x61,45d	60,06±0,86	5,76
SJD 5	xy91,10a	y86,92b	x97,07a	x96,08b	92,79±1,52	6,56
SJN 5	z47,85d	yz48,51e	xy54,50d	x55,96d	51,71±1,11	8,60
$\bar{x} \pm s_{\bar{x}}$	65,39±3,53	73,25±4,53	79,85±4,20	80,32±4,50	74,70±2,17	
$S_{\%}$	24,15	27,63	23,55	25,03	26,03	

-Genotype $LSD_{5\%}$ = 7,87; $LSD_{1\%}$ = 10,52; $LSD_{0,1\%}$ = 13,82 (a,b,c).
-Density $LSD_{5\%V}$= 6,56; $LSD_{1\%}$ = 8,75; $LSD_{0,1\%}$ = 11,45 (x,y,z).

4. Conclusions

Based on the experimental results regarding the influence of genetic and technological factors on some morphological features in paprika bell pepper, we can draw the following conclusions:

- Unilateral statistic evaluation of the influence of genotype and of plant density on fruit length is distinctly significant on the background of significant influence of environmental conditions during the experimental years;

- Changing the planting distance per row from 20 to 30 and to 50 cm resulted in significant increase of fruit length of 8-18%;
- Experimental factors influenced significantly and distinctly significantly fruit diameter;
- The combined effect of genotype and plant density had considerable influences (18.81%) on fruit diameter, a value that is distinctly significant;
- Increasing planting distance per row from 20 to 50 cm resulted in a significant increase of 6-7% of fruit diameter;
- Analysing experimental factors, we see that both genotype and plant density had a distinctly significant influence on pulp thickness in the two experimental years;
- The bell pepper hybrid Bolero and the bell pepper line SJD 5 cultivated at a plant density of 8.3 plants/m^2 (80/40x20 cm) produce pulp thickness superior to that of the experimental mean;

The influence of experimental factors on the phenotypical expression of the number of fruits per plant was distinctly significant in the two experimental years..

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